

CLAIMS

What is claimed is:

1. An apparatus for cleaning a surface within a vessel, the apparatus comprising:
an elongate combustion conduit extending from an upstream end to a downstream end associated with an aperture in a wall of the vessel and positioned to direct a shock wave toward said surface; and
means for movably supporting the combustion conduit at one or more locations along a length of the combustion conduit.
2. The apparatus of claim 1 wherein:
the combustion conduit passes above a first external tube bundle and below a second external tube bundle.
3. The apparatus of claim 1 wherein:
the combustion conduit comprises at least one curved portion.
4. The apparatus of claim 1 wherein:
means comprises one or more spring hangers.
5. The apparatus of claim 4 wherein:
the spring hangers engage first portions of the combustion conduit; and
a second portion of the combustion conduit downstream of the first is held relative to the vessel so as to vertically move with the vessel due to thermal expansion of the vessel, the hangers compliantly accommodating such vertical movement.
6. The apparatus of claim 4 wherein:
at least one of the spring hangers engages the conduit via one or more snubbers.
7. The apparatus of claim 1 wherein:
a nozzle portion of the combustion conduit is parallel to but offset from a second portion of the combustion conduit.
8. The apparatus of claim 7 wherein:
said second portion forms a majority of a length of the combustion conduit.

9. The apparatus of claim 1 wherein:
the combustion conduit comprises a plurality of segments assembled end-to-end.
10. The apparatus of claim 9 further comprising:
external braces spanning a length of at least one of the segments.
11. The apparatus of claim 10 wherein:
there are at least first and second such external braces opposite each other and coupled to each other by at least one clamp grasping a body of an associated one of the segments.
12. The apparatus of claim 11 wherein:
there are third and fourth such braces respectively aligned end-to-end with the first and second external braces and secured thereto and extending relative thereto at a nonright and nonzero angle.
13. The apparatus of claim 9 wherein:
there is a support structure integral with the wall; and
the means includes at least one hanger supporting the combustion conduit from the support structure.
14. An apparatus for cleaning a surface within a vessel, the apparatus comprising:
an elongate combustion conduit extending from an upstream end to a downstream end associated with an aperture in a wall of the vessel and positioned to direct a shock wave toward said surface; and
one or more hangers supporting the combustion conduit at one or more locations along a length of the combustion conduit.
15. The apparatus of claim 14 wherein:
the combustion conduit comprises at least one curved portion.
16. The apparatus of claim 14 wherein:
the hangers are constant load hangers.

17. The apparatus of claim 16 wherein:
 - the hangers engage first portions of the combustion conduit; and
 - a second portion of the combustion conduit downstream of the first is held relative to the vessel so as to vertically move with the vessel due to thermal expansion of the vessel, the hangers compliantly accommodating such vertical movement.